INTEL INVENTION DISCLOSURE

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ATTORNEY-CLIENT PRIVILEGED COMMUNICATION
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Rev. 19 – June 2003

DATE: July 28, 2003

NPSR/ICG/NPG

It is important to provide accurate and detailed information on this form. The information will be used to evaluate your invention for possible filing as a patent application. **Invention Disclosure forms MUST be sent electronically via email to your manager/supervisor who should then forward with their approval to our email account "invention disclosure submission."** If you have any questions, please call **8-264-0444.**

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(PROVIDE SAME INFORMATION AS ABOVE FOR EACH ADDITIONAL INVENTOR)

2. Title of Invention:
Front side Hot Swap CMM Configuration for ATCA Chassis

3. What technology/product/process (code name) does your invention relate to (be specific if you can):
Hot swap fan cooling for blade-based systems and modular form factors; relates to AdvancedTCA, Ecosytem

4. Include several key words to describe the technology area of the invention in addition to # 3 above:

CMM, ATCA shelf management, fan tray, hot swap, chassis, blades, dense servers, AdvancedTCA, ATCA, modular architectures, telecom or data center computing

5. Stage of development (i.e. % complete, simulations done, test chips if any, etc.):

mechanical concept is done

Exhibit 1
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6b. Has your invention been used/sold or planned to be used/sold by Intel or others?

If YES, date it was sold or will be sold: Yes, to be , CDC 03, Telecom Geneva 03 and recommended to carriers in 04.

6c. Is a SIG (special interest group) active in this technology?

If YES, name of SIG: Yes, PICMG

6d. If the invention is embodied in a semiconductor device, what is the actual or anticipated date of tapeout?
2004.

6e. If the invention is software, actual or anticipated date of any beta tests or other distribution outside Intel:

7. Was the Invention conceived or constructed in collaboration with anyone other than an Intel blue badge employee or in performance of a project involving entities other than Intel (e.g. government, other companies, universities or consortia)? NO: yes If YES, name of individual or entity: ADDA

8. Is this invention related to any other invention disclosure that you have recently submitted? If so, please give the title and inventors: No

9. **(Optional)** Which IP Committee do you think should review your invention disclosure based on the descriptions provided in the linked document? http://legal.intel.com/Patent/iptech.asp

PLEASE READ AND FOLLOW THE DIRECTIONS ON HOW TO WRITE A DESCRIPTION OF YOUR INVENTION

Try to limit your description to 2-3 pages contained in ONE WORD DOCUMENT
Do NOT attach a presentation, white paper, or specification

ANSWER ALL OF THE QUESTIONS BELOW

Please provide a description of the invention and include the following information:

1. **Describe in detail what the components of the invention are and how the invention works.**
Telecom servers have dense blades (SBC) fully populated with chips/modules inside the chassis. CMM is a Chassis Management Module. This ATCA component performs the Shelf Manager requirements which are also specified in the PICMG 3.0 base specifications. The Major Shelf Manager requirements are a) Power Management b) Electronic Keying c) Hot-Swap Management and Cooling Management. There are always two CMM (one is redundant). A hot swap is performed to remove malfunctioned CMM and plug a replacement into the shelf. The front serviceability is also required for this hot swap module.

The current method (see Figure 1) has CMMs mounted under the top of the chassis for 12U and 14U system. But a standard telecommunication server rack is 42U~45U and for high density chassis requirement, four chassis in a rack configuration or 10U chassis form factor is needed. In Intel's 10U shared plenum chassis, current CMM configuration is not applicable because of the mechanical/airflow interference.

Option2 for 10U chassis CMM configuration (fig2) solved the above problem, but it is not front serviceable.

The main configurations of the invention are described in Figures 1 and 2:

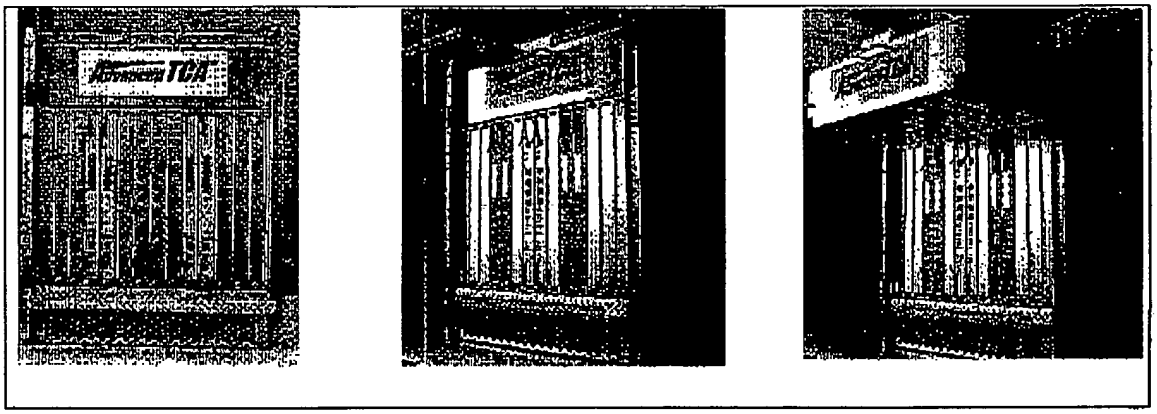

Figure 1. Current ATCA chassis with two CMMs

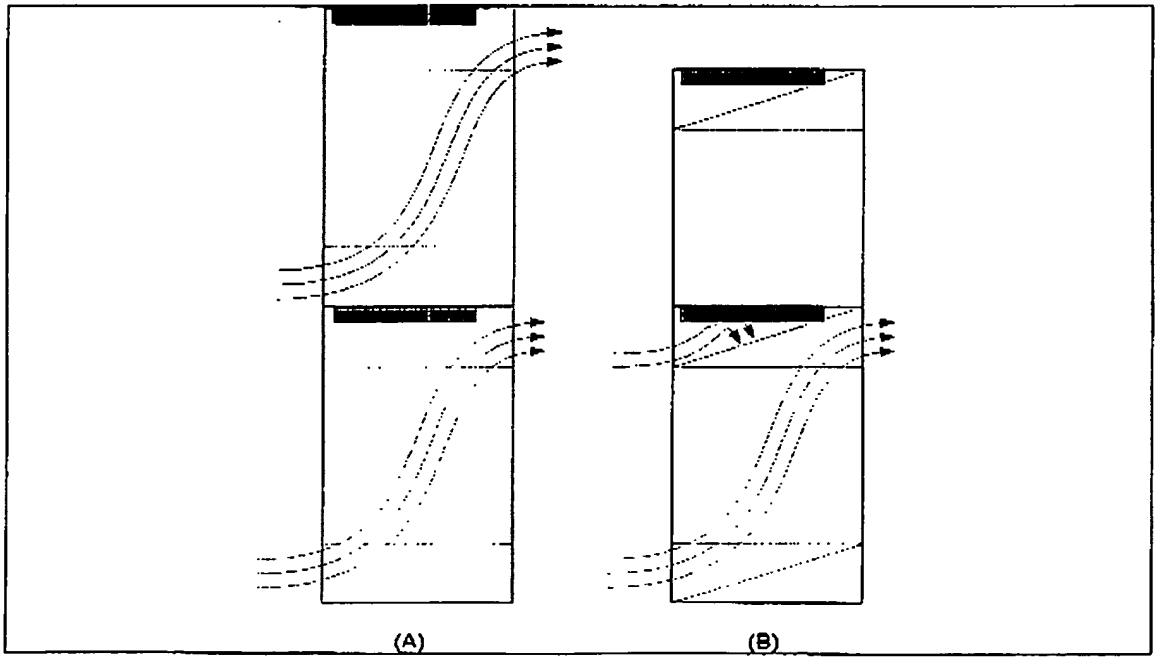

Figure 2. (A) Air flows through independent plenum for 14U system, (B). CMMs blocks air for shared plenum in 10U

Exhibit 1

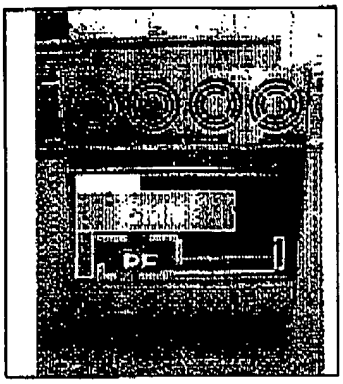

Figure 3 Rear side CMM configuration for 10U ATCA

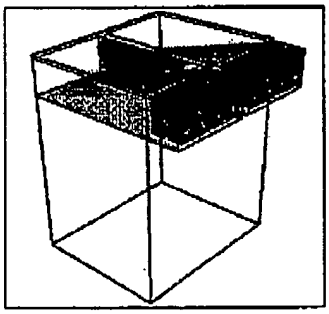

Figure 4. Front side serviceable centered CMMs

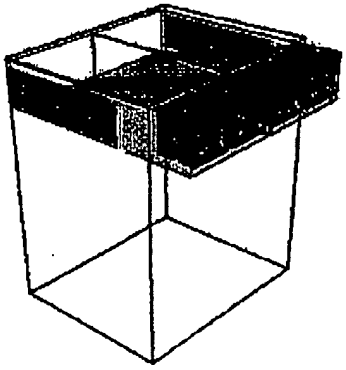

Figure 5. Front side serviceable two-sided CMMs

2. Describe advantage(s) of your invention over what is currently being done.

This new invention offers several advantages. Briefly, the front serviceable CMM configuration approach:

- Fits 10U or small form factor ATCA shelf management
- Provides better cooling for CMM hot components
- Makes 10U CMM redundant applicable

Explanation. All current ATCA and Flexi-Server chassis use single fan tray modules (shown in Figure 1) to cool the blade rack in the chassis (shown in Figure 2). These fan trays have an array of three fans, plus an array of three backup fans. The new dual fan tray module configuration for 10U ATCA produces a flexibility to design the CMM is the shelf management. Having dual fan tray modules offers these strong advantages over the current design:

1) With two fan tray modules, the two CMMs can be designed perpendicularly in the space between two fan trays.
2) Current cooling for CMM components are counting on the nature convection and this results in reliability issue due to the insufficient airflow. Some design also use additional fan for CMM cooling but this increase the noise level, manufacture/maintenance costs

3) The new designs provide more reliable configurations for CMM design. It compliance electrical routing requirement, mechanical specs. It also meets cooling requirement for CMM components because both designs are good for both forced and natural convection cooling. When the two modules are mounted on the two sides inside chassis, they particularly can take advantages of heat radiation and conduction thru the chassis skin. EMC is also enhanced. .
4) Maintenance is easier because the module is lighter.

3. **You MUST include at least one figure illustrating the invention. If the invention relates to software, include a flowchart or pseudo-code representation of the algorithm.**
(Please see the pictures in Figures 1-5.)

4. **Value of your invention to Intel (how will it be used by Intel or a competitor).**
The two by two fan tray module configuration presents an advanced method for chassis cooling. It has immediate value to Intel, primarily because it allows customers to adopt the ATCA standards-based building block approach to their products without having to pay a density penalty (a price for using highly dense boards).

Confidential: In particular, this cooling approach is at the center of an effort to move Nokia to the AdvancedTCA* form factor. Nokia had a custom form factor that allowed them to get four chassis in a rack. Their largest objection to moving their product to AdvancedTCA is that they needed to be able to put four chassis in a standard 42U rack. This concept was developed largely to meet that need.
This idea was disclosed to Nokia under NDA. A rough concept was proposed last August, and a more formal presentation was made in January. After some initial skepticism, Nokia has realized that this approach could meet their needs. We have only discussed this approach with Nokia to date, but securing the IP to this cooling method will give Intel the option of using it with other OEMs if it makes business sense.

This invention could be useful in applications ranging from telco applications to the data center or even the enterprise. It's a way to pack more Intel silicon into a rack and still be able to cool it.

From a defensive standpoint, *not controlling* the IP could put Intel at a tremendous disadvantage if another company tries to protect this cooling method and decides to extract high royalties or altogether prohibit Intel-based systems from using this cooling method.

On the other hand, if Intel controlled this IP, Intel could offer this advanced cooling method as one more reason to utilize Intel silicon in bladed systems. Though this disclosure has focused mostly on bladed systems, this cooling approach may have applicability to other form factors as well, such as standard rack-mount systems.

5. **Explain how your invention is novel. If the technology itself is not new, explain what makes it different.** (Please refer to the Explanation section in question 2.)

6. **Identify the closest or most pertinent prior art that you are aware of.**
Closest art is described as fig.1 and the differences are as above.

7. **Who is likely to want to use this invention or infringe the patent if one is obtained?**
Any company building chassis for bladed or non-bladed systems could potentially infringe this IP.

8. **How would infringement be detected?**
Since fans are fairly large elements in a system, detecting infringement would be relatively easy by a visual inspection (or possibly even from looking at a detailed data sheet of the chassis). Any system that did the following would impinge on this invention:
   - Shared input and exhaust plenums, with each plenum dedicated to a chassis
   - Bottom-to-top airflow path across a blade with fans larger than the plenum in which they are located
   - Combinations of the above two items

HAVE YOUR MANAGER/SUPERVISOR READ AND FORWARD THIS DISCLOSURE ELECTRONICALLY VIA E-MAIL TO "INVENTION DISCLOSURE SUBMISSION"

BY APPROVING, YOUR MANAGER/SUPERVISOR IS ACKNOWLEDGING THAT THE DISCLOSURE HAS BEEN READ AND UNDERSTOOD, AND RECOMMENDS THAT THE DISCLOSURE AWARD BE PAID